(No Model.)

# J. E. THOMAS & E. P. GROW.

## WATER DISTILLING APPARATUS.

No. 491,028. Patented Jan. 31, 1893.

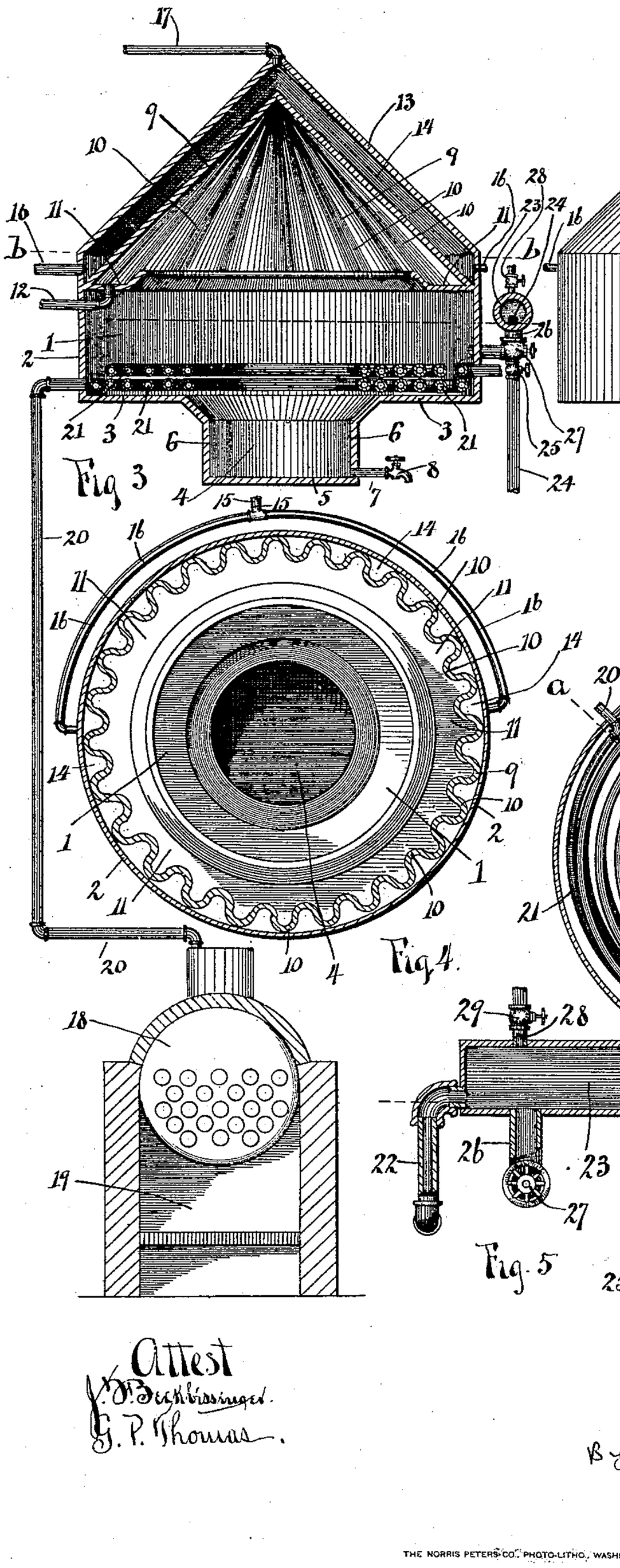

Fig. 3

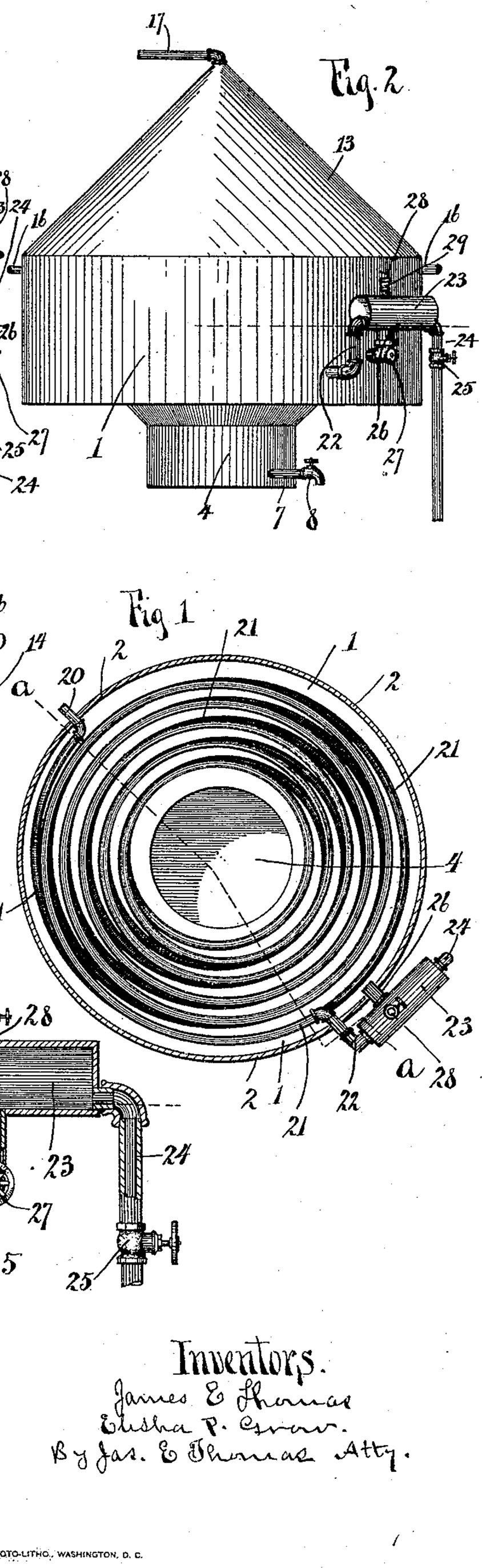

Fig. 2



Fig. 4.



Fig. 1





Fig. 5

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# UNITED STATES PATENT OFFICE.

JAMES E. THOMAS AND ELISHA P. GROW, OF BAY CITY, MICHIGAN.

## WATER-DISTILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 491,028, dated January 31, 1893.

Application filed November 2, 1892. Serial No. 450,736. (No model.)

*To all whom it may concern:*

Be it known that we, JAMES E. THOMAS and ELISHA P. GROW, citizens of the United States, residing at Bay City, in the county of Bay and State of Michigan, have invented certain new and useful Improvements in Water-Distilling Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in apparatus for the purification of water by distillation, and the invention consists in the combination and arrangement of the several parts and devices assembled together, and in the operation of the same as will be presently explained in full detail, and which will also be especially mentioned and enumerated in the claims of this specification.

The object of the invention is to provide an apparatus for the double distillation of water in which the water of the first distillation process is fed automatically to the still for a second distillation, and in a manner to automatically maintain a normal water level in the still, so that a continuous process of double distillation is carried on without interruption or stoppage for refilling or replenishing the second still.

Another object of the invention is to provide a water distilling apparatus with a great condensing and collecting surface, and with means for collecting the sediment formed in the evaporation of the water, and for removing the same from the evaporation.

The invention will be found illustrated in the accompanying drawings in which the same figures of reference are used to indicate the same parts or elements throughout the several views:—

Figure 1, represents a horizontal section of the improved water distilling apparatus. Fig. 2, is a side view in elevation of the same. Fig. 3, is a vertical section of Fig. 1, taken at *a—a*. Fig. 4, is a horizontal section of Fig. 3, taken at *b—b*. Fig. 5, is a vertical section of the automatic apparatus for supplying the still with water.

1, represents an evaporating chamber preferably of a circular form, and 2, is the vertical sides inclosing the same, while 3, is the bottom thereof. The central portion of the bottom 3, is provided with a sunken settling chamber 4, having a bottom 5, and sides 6, which are connected to the outer side of the bottom 3.

7, is a pipe with one end passed into the lower portion of the chamber 4, and its outer portion is provided with a valve 8, through which the contents of the chamber are drawn off as desired.

The upper portion of the evaporator is covered with a roof 9, of conical form, and which is also provided with radial corrugations 10, and beneath the lower edge of the roof 9, is arranged a collecting trough 11, and a pipe 12, is passed through the side 2, of the chamber and into the trough for conducting the water of condensation caught by the trough to the outside of the apparatus. Above the roof 9, is provided an outer casing 13, which incloses an annular conical chamber 14, between the roof and the casing.

15, is a water supply pipe leading from a pump or other suitable source, and this pipe is provided with branch pipes 16, which lead into the chamber 14, on opposite sides of its bottom portion, while a discharge pipe 17, is connected to the top of the chamber 14, and led to any convenient place for discharging the water.

18, is a boiler of any common convenient form.

19, is the fire box provided with a grate in the usual way for carrying fuel.

20, is a steam pipe leading from the boiler and passed into the lower portion of the evaporating chamber 1, and therein provided with one or more volute coils 21, and the outer end of the coil is passed through the side 2, and then provided with a vertical section 22, which is turned horizontally into a reservoir 23, which is located in proximity to the outer side of the side 2, and at a point in a plane with the normal water level within the chamber 1, indicated by the horizontal dotted lines in Figs. 2, 3, and 5.

At the opposite end of the reservoir 23, is attached an over flow pipe 24, and this pipe is provided with a valve 25, and to the lower portion of the reservoir, a pipe 26, is connected by one end and its opposite end is led into the chamber 1, at any convenient point

below the normal water level and this pipe is provided with a valve 27, to regulate the flow of water through the pipe as desired.

The upper portion of the reservoir is provided with an escape pipe 28, for the escape of steam and uncondensed gases that may collect in the reservoir, and a valve 29, is attached to the pipe for closing the same or for regulating the opening of the pipe as desired.

Water is placed in the boiler 18, and steam pressure is raised therein in the usual manner of operating steam boilers, and the steam is conducted by the pipe 20, to the coils 21, within the evaporating chamber 1, which is first supplied with water through pipe 28, or in any other suitable manner sufficient to cover the coils, and the steam in passing through the coils parts with its heat and is nearly all condensed, the heat operating to evaporate the water in contact with the coils, while the water of condensation is pushed by the steam pressure behind, into the reservoir and from thence the water passes through the pipe 26, into the chamber 1, until the water within the chamber 1, has reached a plane level with the reservoir, and then only a portion of the condensation flows into the pipe 26, to retain the desired water level within the evaporator, while the surplus flows from the reservoir 23, through the pipe 24, to any desired point as waste, while all ammoniacal and other gases which remain uncondensed within the pipes and reservoir are allowed to pass out through the pipe 28, so that the water passed into the evaporating chamber is free from ammonia and other deleterious matter. The water in the evaporating chamber being highly heated from the steam within the coils is evaporated at a pressure of one atmosphere, and the vapor rising therefrom comes in contact with the roof 9, which being kept cold by the cold water flowing in the chamber 14, serves to condense the vapor and the water thus produced clinging to the roof flows from the depressed portions to the raised ridges of the corrugations, and flows thence downwardly to the bottom and is caught by trough 11, from which it is conducted outside by the pipe 12, to any desired receptacle. On the evaporation of the water within the chamber 1, all organic and deleterious matters which may have come over with the steam from the first evaporation in the boiler are left behind, and taking the form of light particles, finally go to the bottom and pass within the chamber 4, where they remain, in still water a current being formed around the central portion of the chamber by the heat radiated from the coils on account of the heat being more intense in the outer coil of the series which carries the steam in a compressed condition with substantially a normal degree of heat, and this current forms an eddy in the center of the evaporating chamber 1 directly over the collecting chamber 4, so that all sediment or solid matter developed by the evaporation moves to the center of the evaporating chamber and then slowly settles into the collecting chamber where it remains undisturbed, until the valve 8, is operated to remove the same through the pipe 7.

It will be seen that the action of this apparatus is entirely automatic, the water being pumped into the boiler in the usual way and the steam therefrom freed from the bulk of the impurities contained in the water, is condensed in sufficient quantities to amply supply the evaporating chamber through the pipe 26, and the location of the pipe and reservoir in relation to the evaporating chamber is such as to retain the desired water level in the evaporating chamber while the waste or surplus condensation from the pipe is carried off, and the ammoniacal and other volatile gases which remain in a gaseous form at a low temperature are allowed to rise in the reservoir and pass out through the pipe 28, so that to operate the apparatus continuously it is only necessary to keep the boiler constantly supplied with water and to draw off the contents of the reservoir 4, from time to time as the sediment accumulates therein. Of course it will be noticed that the size of the reservoir 23, is optional with the user as an ordinary horizontal pipe forming a continuation of the vertical section 22, with the pipe 26, attached to its under side would operate in the same way to replenish and maintain the desired water level in the boiler, but by having the reservoir slightly larger than the pipe, a space is provided for the separation of the ammoniacal and other deleterious gases from the water before it enters the evaporating chamber. And it will also be noticed that by partially closing the valves 25, the height of the water in the reservoir 23, may be regulated, it being evident that as water is not allowed to escape through the pipe 24, freely, the water level is raised in the evaporating chamber and also within the reservoir until a sufficient gravity pressure is placed upon the water above the valve to force the water through the valve opening.

The radial corrugations 10, in the roof 9, provide a great area of condensing surface and provide a means for conducting the water formed thereon, to the trough 11, the water collecting in drops upon the roof and running from each side to the under side of the downwardly projecting ribs and following the same into the trough with great activity instead of clinging to a plane surface as in roofs of an ordinary form.

Having described our invention what we claim and desire to secure by Letters-Patent is:—

1. In combination with an evaporating chamber and as a means for automatically preserving the level of water therein, a reservoir arranged exteriorly on a plane with the normal water level of the evaporating chamber, a pipe leading from the bottom of same to the interior of the chamber, a steam coil

within the evaporating chamber connected to said reservoir, a waste pipe leading therefrom, and an escape pipe extending upward from the top thereof, substantially as described.

2. In a water-distilling apparatus, the combination with the evaporating chamber, and a steam boiler, a steam pipe leading from said boiler and passed through and coiled within the lower portion of said chamber, a reservoir horizontally arranged on a plane with the normal water level of said chamber and connected with said steam pipe, a pipe leading from the bottom of the said reservoir to the interior of the chamber below the water level for supplying water to said chamber, a waste pipe connected with the reservoir and leading downward therefrom, and provided with a valve, and an escape pipe leading upward from the reservoir and provided with a valve, substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

JAMES E. THOMAS.
ELISHA P. GROW.

Witnesses:
GEO. P. THOMAS,
T. FLUES.